An Evaluation of the Safety, Utility, and Reliability of Three-Dimensional Alarm Systems for Automotive Use

As roadways become more congested, there is greater potential for automobile accidents and incidents. The National Highway Traffic Safety Administration has recently developed and implemented the Intelligent Transportation System, a global effort to improve roadway safety. As part of this effort, automobile manufacturers are now designing collision avoidance warning systems; yet, there has been little investigation of alarm reliability and spatial signal location. In this experiment, we measured driving and alarm reaction performances to spatial and console emitted alarms of various reliability levels. Seventy participants operated a driving simulator while being presented with alarms. From previous research, we expected drivers to perform better following reliable alarms than unreliable alarms. We also expected better performance following spatial alarms than central alarms. Results indicated that drivers avoided collisions better following spatial alarms, but made more appropriate driving reactions following console-generated alarms. Alarm response frequency and driving reaction appropriateness was higher for reliable alarms. These results suggest that alarm designers should strive to maximize alarm reliability, and that spatial alarms may potentially reduce collision rates. Future researchers should replicate these findings in simulated situations of higher fidelity.

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